AMENDMENTS TO THE CLAIMS

Please amend Claims 1, 22 and 24 and add new Claims 34 and 35.

1. (Currently amended) An atomic layer deposition (ALD) process for producing a thin multicomponent <u>mixed</u> oxide film on a substrate, the thin multicomponent <u>mixed</u> oxide film comprising silicon, transitional metal, and oxygen, the process comprising a plurality of deposition cycles, each cycle comprising:

   contacting a substrate in a reactor with a vapor phase silicon compound such that the silicon bonds to the substrate;

   contacting the substrate with a vapor phase metal compound such that the metal bonds to the substrate;

   converting the bonded silicon and metal compounds into [[**an**]] <u>a mixed</u> oxide by contacting them with a reactive vapor phase oxygen source; and

   purging the reactor with an inert gas after each contacting step and after each converting step.

2. (Original) The process of Claim 1, wherein the process is repeated to form a layer of a desired thickness.

3. (Original) The process of Claim 1, wherein the oxygen source compound is selected from the group consisting of water, oxygen, ozone, and hydrogen peroxide.

4. (Original) The process of Claim 1, wherein the metal compound is a metal halide.

5. (Original) The process of Claim 4, wherein the metal compound is hafnium tetrachloride.

6. (Original) The process of Claim 1, wherein the silicon compound is a silicon halide.

7. (Original) The process of Claim 1, wherein the silicon compound is selected from the group consisting of silicon tetrachloride, hexachlorodisilane, and hexachlorodisiloxane.

8. (Original) The process of Claim 1, wherein the deposition occurs at a temperature range of between 150°C and 450°C.

9. (Original) The process of Claim 1, wherein the deposition occurs at a temperature range of between 300°C and 350°C.

10. (Original) The process of Claim 1, wherein the thin multicomponent oxide film is formed on a hemispherical grain structure.

11. (Original) The process of Claim 1, wherein the substrate is a grooved flat material.

12. (Original) The process of Claim 1, wherein the substrate is a flat material.

13. (Original) The process of Claim 1, wherein the substrate is a bottom electrode of a Dynamic Random Access Memory capacitor.

14. (Original) The process of Claim 1, further comprising depositing a high dielectric constant material over the thin multicomponent oxide film.

15. (Original) The process of Claim 14, wherein the high dielectric constant material is an oxide of the metal in the metal compound.

16. (Original) The process of Claim 1, wherein the thin multicomponent oxide film is deposited on a silicon interface to form part of a transistor gate dielectric.

17. (Original) The process of Claim 16, further comprising depositing a high dielectric constant material over the thin multicomponent oxide film.

18. (Original) The process of Claim 1, wherein the thin multicomponent oxide film forms an interlayer in a transistor gate oxide.

19. (Original) The process of Claim 1, wherein a ratio of silicon compound contacting steps to metal compound contacting steps during the ALD process is in the range of one to ten and ten to one.

20. (Original) The process of Claim 19, wherein the ratio of silicon compound contacting steps to metal compound contacting steps during the ALD process is one to one.

21. (Original) The process of Claim 1, wherein converting comprises separate oxidation steps following each of the contacting steps.

22. (Currently amended) An atomic layer deposition (ALD) process for producing a thin multicomponent mixed oxide film comprising silicon, a transitional metal, and oxygen ~~oxide~~ on a substrate, the process comprising repeating a deposition

cycle until a multicomponent mixed oxide of the desired thickness is formed, the deposition cycle comprising:

pulsing a vapor phase silicon compound into a chamber such that the silicon bonds to the substrate;

pulsing a first reactive vapor phase oxygen source into the chamber to convert the bonded silicon compound into an oxide by contacting them with a reactive vapor phase oxygen source;

pulsing a vapor phase metal compound into the chamber such that the metal bonds to the substrate;

pulsing a second reactive vapor phase oxygen source into the chamber to convert the bonded metal compound into an oxide; and

purging the reactor with an inert gas after each pulsing.

23. (Original) The process of Claim 22, wherein the first oxygen source is the same as the second oxygen source.

24. (Currently amended) A method of manufacturing a gate dielectric film comprising a complete mixed oxide on a substrate, the method comprising:

adsorbing a layer of a silicon compound on the substrate in a self-limiting reaction;

adsorbing a layer of a metal compound on the substrate in a self-limiting reaction;

converting the adsorbed silicon and metal compounds into a tertiary oxide by contact with a reactive vapor phase oxygen source compound; and

purging the reactor with an inert gas after each contacting step and after each converting step; and wherein the adsorbing and converting steps are repeated to form a complete mixed oxide layer of a desired thickness.

25. (Cancelled)

26. (Original) The method of Claim 24, wherein the oxygen source compound is selected from the group consisting of water, oxygen, ozone, and hydrogen peroxide

27. (Original) The method of Claim 24, wherein the metal compound is a metal halide.

28. (Original) The method of Claim 24, wherein the metal compound is hafnium tetrachloride.

29. (Original) The method of Claim 24, wherein the silicon compound a silicon halide.

30. (Original) The method of Claim 24, wherein the silicon compound is selected from the group consisting of silicon tetrachloride, hexachlorodisilane, and hexachlorodisiloxane.

31. (Original) The method of Claim 24, wherein the silicon compound is converted into an oxide by contact with a reactive vapor phase oxygen source before the introduction of the metal compound.

32. (Original) The method of Claim 24, wherein the deposition occurs at a temperature range of between 150°C and 450°C.

33. (Original) The method of Claim 24, wherein the deposition occurs at a temperature range of between 300°C and 350°C.

34. (New) The method of Claim 1, wherein the substrate is contacted with the vapor phase silicon compound multiple times in each deposition cycle.

35. (New) The method of Claim 22, wherein pulsing the vapor phase silicon compound and pulsing the first reactive vapor phase oxygen source are repeated multiple times in each cycle.

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SUMMARY OF INTERVIEW

Applicants wish to thank the Examiner for the opportunity to discuss the pending Office Action in a telephone interview with the undersigned on July 26, 2006.

Exhibits and/or Demonstrations

None.

Identification of Claims Discussed

The pending claims were discussed.

Identification of Prior Art Discussed

The George reference cited in the Office Action was discussed.

Proposed Amendments

None.

Principal Arguments and Other Matters

The difference between superlattices and multicomponent mixed oxides was discussed.

Results of Interview

Applicants agreed to submit a response consistent with the discussion.